What Is Claimed Is:

1. An optical bandwidth source for generating amplified spontaneous emission (ASE) across a particular wavelength range, the optical bandwidth source comprising:

a waveguide having a first end and a second end, and the waveguide having a plurality of separate wavelength gain subsections arranged in a serial configuration to form an active waveguide between the first end and the second end;

wherein each of the wavelength gain subsections is arranged relative to one another so as to produce ASE across the particular wavelength range.

2. An optical bandwidth source according to claim 1 wherein said waveguide comprises a single mode waveguide.

3. An optical bandwidth source according to claim 1 wherein said waveguide comprises a multi-mode waveguide.

4. An optical bandwidth source according to claim 1 wherein the particular wavelength range has a width of at least 100 nm.

5. An optical bandwidth source according to claim 4 wherein the width of the particular wavelength range is about 200 nm.

6. An optical bandwidth source according to claim 1 wherein the plurality of separate wavelength gain subsections of the waveguide comprise a quantum-well structure having a given gain profile in a direction from the first end of the waveguide toward the second end of the waveguide, wherein the gain profile of the quantum-well structure comprises a bandgap varying from lower to higher energy.

7. An optical bandwidth source according to claim 6 wherein the gain profile of the quantum-well structure is varied in a discrete fashion along a length of the waveguide.

8. An optical bandwidth source according to claim 6 wherein the gain profile of the quantum-well structure is varied in a continuous fashion along a length of the waveguide.

9. An optical bandwidth source according to claim 6 wherein the quantum-well structure is formed by semiconductor regrowth.

10. An optical bandwidth source according to claim 6 wherein the quantum-well structure is formed by quantum-well intermixing.

11. An optical bandwidth source according to claim 1 wherein at least a portion of the waveguide is curved between the first end and the second end.

12. An optical bandwidth source according to claim 11 wherein the curved portion of the waveguide forms an angle within a range of about 8^{0} to 13^{0}.

13. An optical bandwidth source according to claim 12 further comprising an antireflection coating deposited adjacent to the second end of the waveguide.

14. An optical bandwidth source according to claim 11 wherein the second end of the waveguide comprises a semiconductor facet having the antireflection coating disposed thereon so as to prevent distortion of a profile of the generated ASE.

15. An optical bandwidth source according to claim 14 further comprising a mirror disposed at the first end of the waveguide.

16. A system for generating amplified spontaneous emission (ASE) across a particular wavelength range, the system comprising:

an optical bandwidth source for generating the ASE across the particular wavelength range, the optical bandwidth source comprising:

a waveguide having a first end and a second end, and the waveguide having a plurality of separate

wavelength gain subsections arranged in a serial configuration between the first end and the second end;

wherein each of the wavelength gain subsections is arranged relative to one another so as to produce ASE across the particular wavelength range;

a thin-film tap configured adjacent to the second end of the waveguide to divert a portion of the ASE produced by the waveguide to an auxiliary pathway;

a power monitor configured to receive the portion of the ASE diverted along the auxiliary pathway so as to monitor the ASE produced by the optical bandwidth source;

an isolator configured to receive the ASE remaining from the portion diverted toward the power monitor, the isolator configured to eliminate feedback therethrough toward the waveguide; and

a filter fiber pigtail configured adjacent to the isolator in opposition to the waveguide so as to receive ASE emitted from the waveguide after passing through the isolator.

17. A system according to claim 16 wherein said waveguide is a single mode waveguide and further wherein said filter fiber pigtail is a single mode filter fiber pigtail.

18. A system according to claim 17 wherein said waveguide is a multi-node waveguide and further wherein said filter fiber pigtail is a multi-mode filter fiber pigtail.

19. A system for generating amplified spontaneous emission (ASE) according to claim 16 further comprising a mounting substrate in thermal connection to a thermoelectric cooling device (TEC), and the mounting substrate in thermal connection to the optical bandwidth source.

20. A system for generating amplified spontaneous emission (ASE) according to claim 19 wherein the mounting substrate is in aluminum nitride carrier.

21. A method for generating amplified spontaneous emission (ASE) across a particular wavelength range, the method comprising:

providing a waveguide having a first end and a second end, and the waveguide having a plurality of separate waveguide gain subsections arranged in a serial configuration to form an active waveguide between the first end and the second end; and

electrically biasing a first waveguide gain subsection and a second waveguide gain subsection from the plurality of separate waveguide gain subsections, the first waveguide gain subsection being configured between the first end and the second waveguide gain subsection, the second waveguide gain subsection being configured between the second end and the first waveguide gain subsection, and the first waveguide gain subsection configured with a quantum-well structure having a bandgap with lower energy than the second waveguide gain subsection so as to produce longer wavelength ASE at the first waveguide gain subsection than at the second waveguide gain subsection, wherein the waveguide produces ASE across the particular

wavelength range at the second end thereof formed by ASE produced by the first waveguide section and the second waveguide section.

22. A method according to claim 21 wherein said waveguide comprises a single mode waveguide.

23. A method according to claim 21 wherein said waveguide comprises a multi-mode waveguide.

24. A method according to claim 21 wherein the particular wavelength range has a width of at least 100 nm.

25. A method according to claim 21 wherein the width of the particular wavelength range is about 200 nm.